

Play: Early and Eternal

(self-motion play/peragration/primary play/play development/play persistence)

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ABSTRACT A systematic 12-week investigation of development of play behavior was conducted with eight socially reared rhesus monkey infants. A new, basic and primary play form termed *self-motion play* or *peragration* was identified and examined. This behavior follows a human model which includes a wide range of pleasurable activities involving motion of the body through space, e.g., rocking, swinging, running, leaping, and water or snow skiing. It can be argued that self-motion play is the initial primate play form and because of its persistence constitutes a reinforcing agent for maintaining many complex patterns and even pastimes.

Monkey self-motion play in the present study was divided into five separate patterns in order to compare the relative importance of social and individual peragration play, the role of apparatus and the overall developmental relationships between the different individual and social self-motion play patterns. The data showed that from 90 to 180 days of age self-motion play was independent of other forms of play, that individual self-motion play appeared earlier and with significantly greater increases in frequency than did social self-motion play, and that apparatus was a necessary component for significant increases in social self-motion play. Other findings were that self-motion play existed independent of locomotion and, though initiated by exploration, was separate from it. Therapeutic implications of self-motion play were discussed.

Behaviors sheltering under the ubiquitous umbrella called play are as diverse as the theories proposed and propounded to account for their existence. The area of behavior termed play has not been historically ignored nor neglected yet remains, scientifically, an almost unmarked maze which has defied systematic exploration. The only general consensus on the subject of play is an acceptance of the statement made by Hurlock (1) 40 years ago that there is no agreement among writers about play. The literature is permeated with normative studies that catalog activity preferences, toy preferences, and preferences for every game from tiddleywinks to camber casting. Many of the studies of play reflect the biased assumption that play must have a personal or utilitarian function. For example, Spencer (2) conceived of play as a release of surplus energy, whereas Groos (3) viewed infant play as a classroom for direct training for future adult activity. Many other investigators have taken the Freudian position that emotional conflicts and aggressions are alleviated or resolved through the vehicle of imaginative play, such as play with dolls, with finger paints, or even with gooey dough.

There has been far greater agreement as to what constitutes the form and function of play among members of the non-human than the human primate species. This is probably the case because scientists are not inclined to postulate ulterior

motives for nonhuman animal play. Research with these primates has been devoted to social play to such an extent that references to play among subhuman primates are practically synonymous to references to social play, i.e., play with playmates.

Investigators have recognized the importance of age-mate or peer relationships for the normal and natural development of social and sexual roles in the monkey (4, 5). Searching for antecedent mechanisms responsible for the development and maintenance of positive peer interactions, Harlow concluded that play was the variable of primary and underlying importance. Laboratory researches have consistently demonstrated that inadequate affectional interchange between mother and infant delays and debases play's appearance and form. Without play there is little opportunity to build peer interaction, affection, and positive sexual and social roles (8). This vicious and vacuous circle is eliminated when the maternal-infant and infant-maternal love systems are functioning famously. At the right time mothers bestow upon the infants maternal blessings facilitating play with peers and provide the security for the babies to feel free to venture forth away from mother and to explore. Little by little the infant monkeys discover play, and from then on play holds sway.

During the fourth through the eighth month of life in rhesus monkeys a consistent form of play emerges in both sexes but at higher levels in male infants. Termed rough-and-tumble play, it is characterized by active physical contact, including rolling, wrestling, and sham biting. Blurton Jones (6) observed similar forms of play among English nursery school children. He forcefully stated that patterns of play almost identical to the monkey rough-and-tumble activity occur and are clearly definable in human children. Another play pattern of the rhesus parallels rough-and-tumble play but is more characteristic of the female. This form has been called approach-avoidance play and has an obvious human counterpart in the universal game of tag.

Harlow has searched for antecedents to these complex social play behaviors. Exhaustive research, both prior and subsequent to study of peer play, has been conducted on curiosity and manipulative activity of the rhesus monkey. Monkeys both young and old readily explore and manipulate novel objects in the absence of any explicit external reward. Initially, monkey infants are equally curious toward social and nonsocial objects, but they soon come to prefer animate playmates to inanimate objects (4). Harlow formulated the hypothesis that unlearned curiosity and manipulation were the antecedents for social play. Both curiosity-exploration and play behaviors develop along similar maturational courses

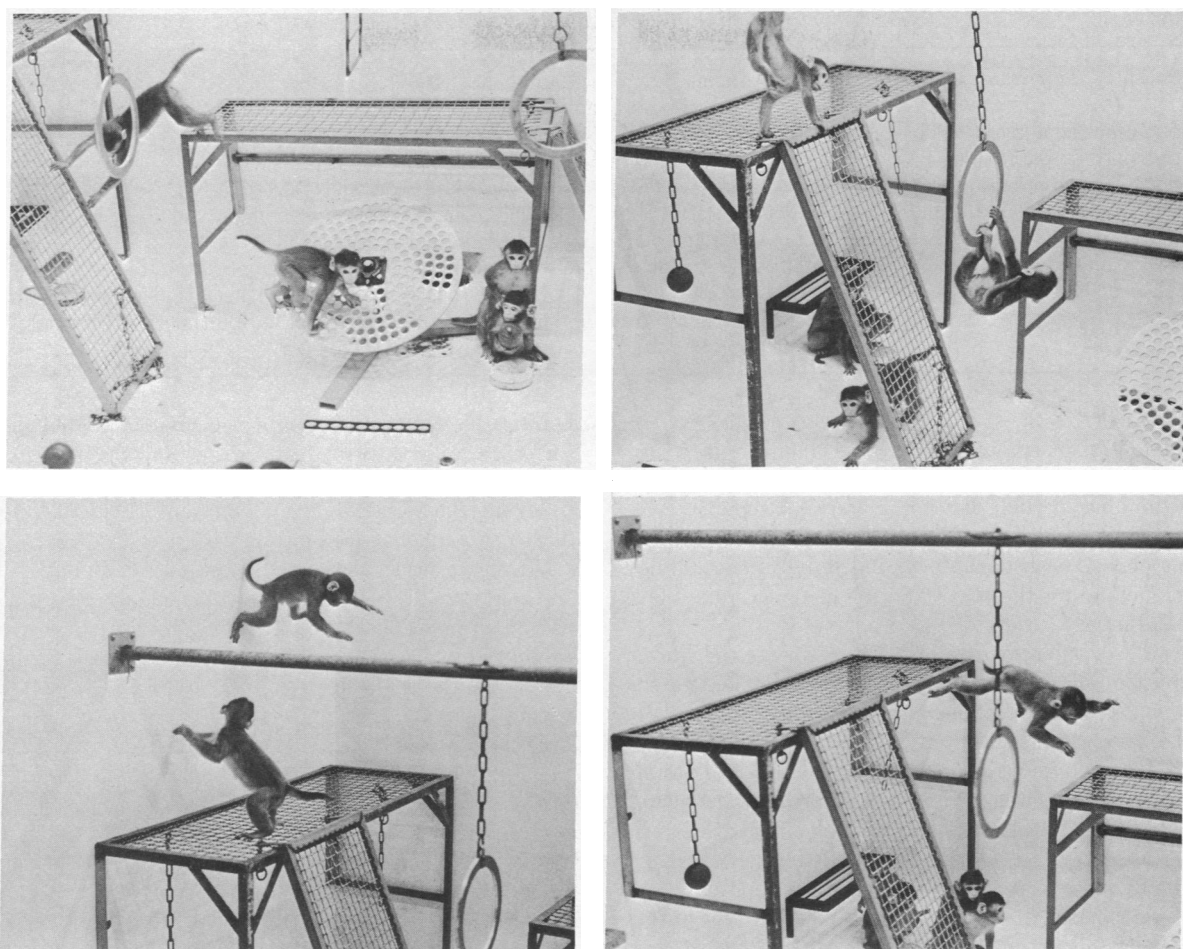


FIG. 1. Examples of self-motion play.

Social play progressively burgeons after curiosity is well under way, and each successive stage of curiosity is followed by new social developments.

Mears had been interested in the role of physical activity and of athletic games in developing and maintaining positive social adjustment. Most of the studies of children's play were conducted in the physically circumspect environment of the inside rooms of nursery schools. Very few offered the freedom and range of outdoor activities. A child may go into the house to play with dolls and trains, to play records, or to play store. A child will go out to play, for the sake of play itself, out where there is room to be free, to run, to leap, to hop, and to jump, or, in the words of Stevenson:

"How do you like to go up in a swing,
Up in the air so blue?
Oh, I do think it the pleasantest thing
Ever a child can do!"

Mears has recently postulated that the fundamental play form, primary and basic to social play, is centered upon a group of behaviors appropriately termed self-motion play. This play form is not manipulation or motion of other objects by the self but rather motion of the self as a reinforcer in and of its own right. As such, self-motion play can be differentiated from both traditional locomotor activity and the above forms of social play. Apparatus may be involved but is not obligatory. Monkey self-motion play is illustrated in Fig. 1. Human

self-motion play takes place primarily outdoors. When it takes place indoors, parents protest. It may be either solitary or social. A rarely used term, *peragration* (motion through space), provides a perfect description. There was some temptation to use the phrase *activity play*, but several scientific investigators have already applied this phrase to the manual manipulation of objects, an act that may occur in the course of self-motion play but is not exclusively self-motion play itself. Kinesthetic sensations are evident in personal peragratings but, again, precedents might cause confusion. For example, Kulka, Fry, and Goldstein (7) hypothesized kinesthetic needs in infancy, with motility the modality of expression. They used "kinesthetic" to refer to sensations from light, touch, pressure, temperature, viscera, and all their central representations. In self-motion play there are kinesthetic sensations, but only in the customary scientific sense—sensations from the muscles, tendons, and joints—and self-motion play is far more than these sensations. It is the behaviors themselves. To reduce play to sensations is reduction to absurdity.

The existence of self-motion play has long been recognized by many scientific investigators, in fact if not in name, but no one has realized its significance to the child nor its probably long-term influence on development through adolescence and even into old age. Endless examples of such human activity extend from rocking in the cradle to rock and roll and then on to the rocking chair as one approaches the Rock of Ages. The indoor baby swing moves outdoors to become the swing or tire

TABLE 1. *Definitions of behavioral categories scored (condensed)*

1. Self-motion play (apparatus, nonsocial):	Swinging, jumping, leaping on or from apparatus, running, acrobatics, accelerated or general bodily motion through space and involving apparatus.
2. Self-motion play (no apparatus, nonsocial):	Same as no. 1 but without apparatus.
3. Self-motion play (apparatus, social):	Same as no. 1 but with monkey interaction.
4. Self-motion play (no apparatus, social):	Same as no. 2 but with monkey interaction.
5. Self-motion play (rough-and-tumble):	Social play, vigorous physical contact, rolling, wrestling, sham fighting.
6. Locomotion:	Ambulatory activity not otherwise delineated.
7. Tactile-oral exploration:	Active manual or oral contact with inanimate environmental objects.
8. Abnormal, maladaptive behaviors:	Separately recorded were the following behaviors which, if persistent, indicate abnormality: rocking-huddling, self-mouth, self-clasp, ventral cling, surrogate contact, and infantile sex.

under the old oak tree; next the ferris wheel or roller coaster beckon and, finally, one day a disgruntled Dad unwinds in the hammock or on the front porch swing. Roller skating, ice skating, swimming, diving, dancing, water and snow skiing, the rocking horse, horseback riding—all are encompassed by self-motion play. The list lengthens indefinitely, concluding with the parachute for the brave and the merry-go-round for the meek and mousy.

In the world of subhuman primates the story is the same. Harlow and Zimmermann (8) experimentally demonstrated the preference of the infant rhesus for the surrogate mother who rocked over the one who only stood ungaited. Kohler's chimpanzees polevaulted with pleasure and without bribes of bananas or bonbons. Every primatologist or any and every child who has visited the zoo has witnessed the monkeys which fly through the air with the greatest of ease, rivaling the famed man on the flying trapeze. The behaviors of motion play become less stereotyped the higher the animal's position in the phyletic scale. "Some fishes periodically leap above the water's surface, birds indulge in elaborate aerial maneuvers, colts gallop, puppies race, and kittens scamper," according to Beach (9). For countless years self-motion play in many animals has been described in detail and ignored in intent, even if unintentionally.

The present research was designed to test the existence of self-motion play as an identifiable entity and to investigate the developmental relationships between social play, curiosity-exploration, and self-motion play.

METHOD

Subjects, Apparatus, and Procedure. Subjects in the present investigation were eight infant rhesus monkeys (*Macaca mulatta*), four males and four females, all born within a 26-day period. Each monkey was separated from its mother at birth and reared for its first days of life in the laboratory nursery.

During this period each infant was given a heated simplified surrogate, fully described by Harlow and Suomi (10), surrogate mothers being chosen over real monkey mothers in order to avoid the physical trauma of mother-infant separation during subsequent social testing with peers.

When the mean age of the subjects was 30 days, all were transferred with their surrogates from the nursery to individual quadrants of two 76 × 61 × 76 cm quad cages (11). Membership in each quad cage was sex-balanced. Beginning at this time the subjects were permitted to interact socially within the quad cages for 1 hr/day, 5 days/week. For the first 2 weeks only pair interaction was permitted, but thereafter, all members of each quad cage were allowed to interact as groups of four.

The subjects were next introduced to the experimental situation by being placed, periodically, with their surrogates in the laboratory playroom. This 236 × 249 × 213 cm room had been designed specifically for the present study to enhance opportunities for self-motion play. Platforms of varied heights were placed within leaping distance of each other, with ladders of appropriate heights for escalation. A revolving wheel and ladder, a long, high bar, and rings swinging from chains also were possible jumping targets. Oral and tactile manipulation were encouraged by rubber strips, varied toys, a ball and chain, and an interlocking puzzle. Stationary low platforms provided places for passive, platitudinous peaceful social or solitary interludes. The playroom is illustrated in Fig. 2.

Beginning at an average of 9 weeks of age, subjects were placed in the playroom with their surrogates for 1 hr/day, 5 days/week. For the first 2 weeks of playroom exposure subjects interacted in groups of four, but thereafter all eight monkeys played in the playroom simultaneously for a period of 12 weeks from the age of 3–6 months.

Data Collection and Analysis. Subjects were observed for 10 min each, 5 days/week, from the time of introduction to the

TABLE 2. *Time block effects during playroom testing*

Category	df	Mean square	F	P	Direction
Self-motion play, apparatus, nonsocial	11/44	320.419	6.53	$P < 0.0005$	Increasing
Self-motion play, no apparatus, nonsocial	11/44	61.988	4.26	$P < 0.0005$	Increasing
Self-motion play, apparatus, social	11/44	67.969	10.35	$P < 0.0005$	Increasing
Self-motion play, no apparatus, social	11/44	6.625	1.15	NS	
Self-motion play, rough-and-tumble	11/44	6.564	1.69	NS	
Locomotion	11/44	47.805	1.09	NS	
Environmental explore	11/44	21.473	1.47	NS	

NS, not significant.

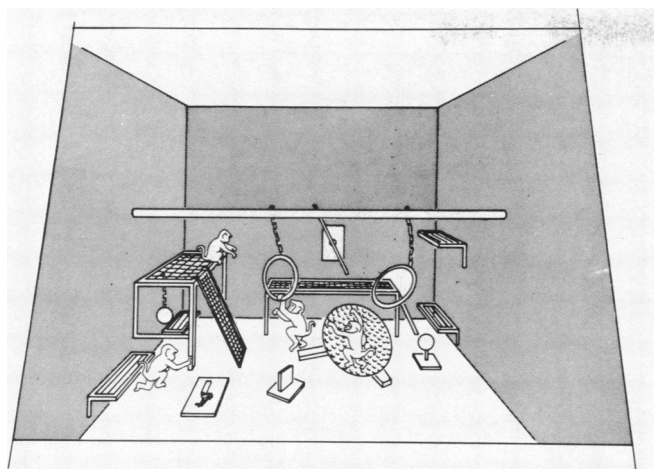


FIG. 2. Modified social playroom.

quad cages until the end of the sixth month of life. Observations were recorded by two experienced testers, both of whom had previously achieved the laboratory standard criteria for reliability. In addition, they underwent reliability checks every 2 weeks, and the interobserver r was consistently in excess of $+0.90$. Observations always took place between the hours of 1:00 a.m. and 3:00 p.m.

Observations consisted of sequential recording of behaviors falling into predefined behavioral categories. These categories included five associated with self-motion play. Operational definitions of categories are listed in Table 1.

The raw data, which consisted of frequencies for each behavior category per subject per session, were first reduced by calculating a weekly mean per category per subject per session, then were subjected to a series of analyses of variance. For each category, behaviors recorded during the initial 2 weeks of playroom testing, when subjects interacted only in groups of four, were subjected to similar one-way repeated-measures analyses of variance with week time block as the repeated measure. Finally, behaviors recorded during the remaining weeks of playroom testing were subjected to category-by-category one-way repeated-measures analyses of variance, with week of age as the repeated measure. For those analyses that yielded a significant effect of weeks, Duncan New Multiple Range tests (12) were administered to the appropriate means.

RESULTS AND DISCUSSION

The results of the present investigations clearly demonstrated that various forms of self-motion play can be reliably identified in the infant monkey's growing behavioral repertoire. Further, it was found that these forms develop independent of other locomotor activity and separate though not divorced from exploration-curiosity. They almost entirely precede exhibition of the forms of social play previously described.

The primary finding lay in the clear emergence and development of a variety of forms of self-motion play. Table 2 delineates the significant main effects associated with the time block variable found in the analyses of the eight-monkey playroom interactive data. As can clearly be seen from the table, three of the five predefined forms of self-motion play showed significant increases over time (P 's < 0.0005) and were the only behaviors in the entire repertoire to show significant increases in frequency.

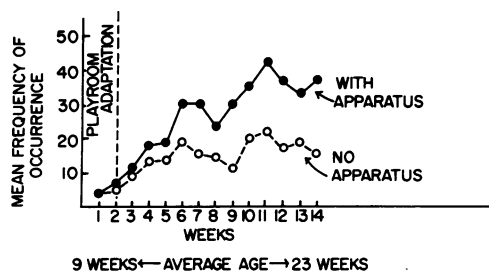


FIG. 3. Development of self-motion play: apparatus contrasted with no apparatus.

Fig. 3 plots the development of self-motion play involving the apparatus in the playroom, as opposed to that occurring without the use of any apparatus. The adequate apparatus in the special playroom obviously aided and abetted acts of peragrations. However, self-motion play did not depend entirely upon props for its importance. Even without the enticement of the whirling wheel and the swinging rings, the infant rhesus subjects spend considerable time simply running, chasing, doing flips in the air, and tumbling on the floor.

Self-motion play, as an entity, achieved far higher frequencies of occurrence than did either locomotion or exploration in the time span covered by the present study. Lest even the sophisticated observer confuse the drunken-sailor gait of the neonatal rhesus with self-motion play, all ambulatory behavior from one location to another, walking or climbing, was scored as locomotion unless it involved increased acceleration or greater complexity. As Fig. 4 shows, the 9-week-old infants were ambulating almost three times as frequently as they were engaging in self-motion play, but locomotion rapidly reached a plateau. Self-motion play was just beginning to burgeon. By the end of the experiment the relative frequencies of the two activities were reversed.

That exploration was not the sustaining or prime factor in self-motion play behaviors is obvious from Fig. 5. There is no doubt of the importance and priority of curiosity-exploration in the initiation of all new behaviors. It is the *sine qua non* in the origin of different and varied activities, permitting the strange to become familiar. Once the strangeness of new self-motion play behavior disappeared in the present study, however, curiosity-exploration continued at an even pace while self-motion play rose rapidly to a frequency six times as great.

A comparison of individual and social self-motion play (Fig. 6) indicates that individual rather than social peragrations holds the preferred role in the first 6 months of rhesus

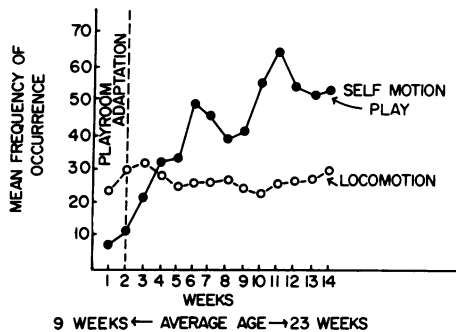


FIG. 4. Development of self-motion play contrasted with locomotion.

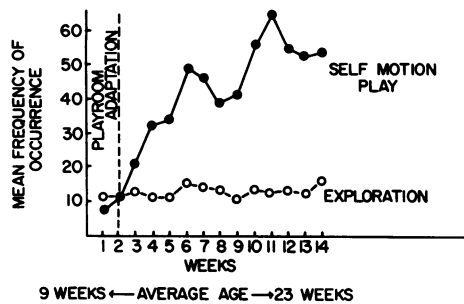


FIG. 5. Development of self-motion play contrasted with curiosity-exploration.

life. Self-motion play can obviously be social as well as solitary, but it develops earlier and to a greater extent as an experience of the solitary animal. The present study concluded when the rhesus infants were the very age, 23 weeks, at which social contact and noncontact play begin to spiral (13). Supporting Rosevear's data, in this study social rough-and-tumble play did not achieve the levels shown by the other forms of self-motion play. Social self-motion play in general develops along with the stronger solitary source. It is interesting to note that well-equipped playgrounds reduce both social play and social conflicts among human children (14).

In his research on nursery school children, Blurton Jones (6) included in rough-and-tumble play more than the rough fake fighting, wrestling, and tumbling which are the primary factors in this play as described in the Wisconsin researches. Added to these behaviors were running, chasing, fleeing, and jumping up and down, all of which might alternatively be described as forms of peragrations. Above and beyond these behaviors was one of even greater import, the laughter which accompanied all of the aspects of this play. Blurton Jones perceived the pure enjoyment of self-motion play in some of its guises and also suspected that there might be some far-reaching behavioral implications for the human child. He mentioned that some of the children new to the school did not immediately share the frolicking fun and that some children never did learn how to join in and jostle just for fun. What kind of adults, he mused, would these children become?

That self-motion play may contribute to the development of positive personality characteristics is suggested also by additional data gleaned during the present research. The data recorded on the abnormal behaviors of these eight monkeys were compared with data from sex-matched pairs of the same ages, reared under similar conditions. The social hours of the latter, however, were in a quad cage, without adequate room or apparatus for self-motion play. The eight rhesus with the opportunity for playroom peragrations consistently showed much lower levels of rock-huddle and ventral cling, both of which, in monkeys and humans, are indicative of psychopathology. Within limits, it is possible that self-motion play may act as a silent but subtle type of psychotherapy.

It is our belief that in primates—monkeys and men—self-motion play begins shortly after birth, as ambulatory capability matures and continues throughout life, in changing manifestations, to contribute its integrative components and

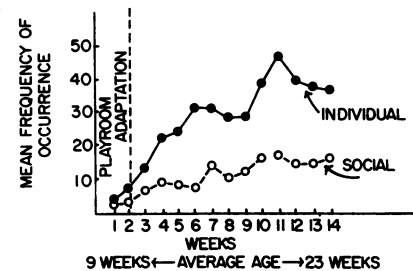


FIG. 6. Development of self-motion play: individual contrasted with social.

continuities to individual and social development. The data from the present research with monkeys show that self-motion play during the early months of life exists as an entity of more force and frequency than other forms of play and locomotor activity. The only form of social play to increase significantly during this research was social play based on the use of apparatus, a fact which suggests the role this form of play may take in the development of social play. Self-motion play is a basic form from which other play patterns evolve and from which certain pleasures associated with perception of motion predominate. We believe that it is basically a complex, unlearned, unconditioned motor response, insofar as any primate behaviors are completely unlearned. Its power is achieved by two overriding qualities. The first is that it is primary—it emerges chronologically prior to other forms of play. Of equal importance is the persistence of self-motion play. It continues throughout developmental periods, thus providing a foundation for perfection of increasingly complex behaviors. In humans this achieves an apex in the precision of the professional athlete's movements or in the cultural culmination, the ballet.

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